

ADDENDUM NO. 1

LJT - PAVEMENT REHABILITATION – 2012

PROJECT NO. A072-1003

OFFICIAL NOTICE NO. 6720

**GENERAL MITCHELL INTERNATIONAL AIRPORT
Milwaukee County, Wisconsin**

Prepared By: **MILWAUKEE COUNTY DEPARTMENT OF ADMINISTRATIVE
SERVICES, ARCHITECTURE, ENGINEERING, AND
ENVIRONMENTAL SERVICES, AIRPORT ENGINEERING DIVISION.
5300 SOUTH HOWELL AVENUE
MILWAUKEE, WI 53207
Telephone 414-747-5774**

DATE OF ADDENDUM: APRIL 16, 2012

BIDS CLOSE: 2:00 P.M., WEDNESDAY APRIL 25, 2012

TO ALL BIDDERS:

Each bidder shall read this Addendum in its entirety to determine to what extent his proposal and the contract conditions will be affected. This Addendum to the Contract Documents is issued to modify, explain, or correct the original documents and is hereby made part of the Contract Documents.

RECEIPT - Sign the following receipt and attach to submitted Proposal Form.

Receipt of Addendum No. 1, consisting of twenty-four (24) pages, for **LJT – AIRFIELD PAVEMENT REHABILITATION - 2012**, Official Notice No. 6720, at General Mitchell International Airport, Milwaukee, Wisconsin, dated April 16, 2012, is acknowledged.

Date _____ Firm _____
Per _____ Address _____

CHANGES

SPECIFICATIONS

Section 06 Proposal (Page 1 of 2)

Revise to read as follows, "Bids Close: No later than Wednesday April 25th, 2012 @ 2:00 pm.

Section 027 Safety & Security Specs Timmerman Field

Clarify no badging or contractor driver training requirements at Lawrence J. Timmerman Field.

Section 030 Special Provisions (Page 4 of 5) Paragraph 11

Add the following, skid steer with broom application shall be available at all time during construction activities for project site clean-up.

Section P-152 Excavation & Embankment.

Excess soils may be stockpiled at owner's on site stockpile location.

Modified Specification P-401 Plant Mix Bituminous Pavements (SuperPave)

Replace Section 031e – Standard Specifications with the attached Section 031e Standard Specifications P-401 (Page 1 of 22).

Basis of Payment Section 401-8.1 Payment

Revise to read as follows, "The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons of bituminous mixture and 100 percent of the product of the contract unit price and the number of tons of bituminous material used in the accepted work."

Basis of Payment a. Basis of Adjusted Payment.

Add the following paragraph, "Although it is theoretically possible to achieve a pay factor of 106 percent for each lot, actual payment above 100 percent shall be subject to the total project payment limitation specified in paragraph 401-8.1.

PLANS

Sheet 4 of 5 Proposed Conditions Plan Hangar Paving Rows B & C.

Delete sentence geo-textile fabric materials & installation shall be incidental to asphalt paving. Revise paragraph 2 under Notes to read as follows, "Contractor shall install geo-textile fabric, Type SAS (Sub-grade Aggregate Separation) prior to placement of CABC."

**STANDARD SPECIAL PROVISION P401-015
MODIFIED SPECIFICATION P-401 PLANT MIX BITUMINOUS PAVEMENTS (SUPERPAVE™)**

DESCRIPTION

401-1.1 This item shall consist of a surface, base, or leveling course composed of mineral aggregate and bituminous material mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross sections shown on the plans. Each course shall be constructed to the depth, typical section, or elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 AGGREGATE. Aggregates shall consist of crushed stone, crushed gravel, or crushed slag with or without sand or other inert finely divided mineral aggregate. The portion of materials retained on the No. 4 (4.75 mm) sieve is coarse aggregate. The portion passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (0.075 mm) sieve is fine aggregate, and the portion passing the No. 200 (0.075 mm) sieve is mineral filler. All aggregate property tests shall be conducted by an accredited laboratory that meets the requirements of section 401-3.5. Aggregate test results shall not be greater than one year old. If test results are provided on the combined blend, the Engineer reserves the right to require tests on individual aggregates should a major change in the Job Mix Formula percentages occur.

a. Coarse Aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from adherent films of matter that would prevent thorough coating and bonding with the bituminous material and be free from organic matter and other deleterious substances. The percentage of wear shall not be greater than specified in Table 1 when tested in accordance with ASTM C 131. The sodium sulfate soundness loss shall not exceed values as specified in Table 1 after five cycles, when tested in accordance with ASTM C 88. In addition, freeze-thaw soundness tests shall be conducted, according to AASHTO T 103, on crushed stone aggregates produced from sources in limestone/dolomite formations in specified counties when those aggregate are used in upper layers. Aggregate retained on the No. 4 (4.75 mm) sieve shall be tested using either method A with 50 cycles, method B with 16 cycles, or method C with 25 cycles. The weighted average loss shall not exceed 18 percent. Freeze-thaw tests shall be conducted on material from sources in the following counties:

Brown	Fond du Lac	Iowa	Oconto	Walworth
Columbia	Grant	Jefferson	Outagamie	Winnebago
Dane	Green	Lafayette	Rock	
Dodge	Green Lake	Marinette	Shawano	

The Engineer may waive this requirement for soundness testing by freezing and thawing for existing quarries determined to be in either the Silurian system or the Prairie du Chien group of the Ordovician system of rocks in Wisconsin.

When all aggregates used in the work are produced from the same deposit or source, the test may be made on a composite sample. The composite sample shall contain the JMF percentages of each component aggregate. When the component aggregates are produced from more than one deposit or source, the tests will be made on one sample from each deposit or source.

The combined coarse aggregate material shall contain fractured faces by weight in accordance with Table 1. The fractured faces percentage for any crushed gravel aggregate material, retained on the No. 4 (4.75 mm) sieve after crushing, shall be determined in accordance with ASTM D 5821. The area of each face shall be equal to at least 75 percent of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be obtained by crushing.

The aggregate shall not contain more than 5 percent, by weight, of flat or elongated pieces, when tested in accordance with ASTM D 4791 using a ratio of 5:1.

Slag shall be air-cooled, blast furnace slag, and shall have a compacted weight of not less than 70 pounds per cubic foot when tested in accordance with ASTM C 29.

b. Fine Aggregate. Fine aggregate shall consist of clean, sound, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls.

The fine aggregate material shall have sand equivalent values from Table 1 or greater when tested in accordance with ASTM D 2419. The fine aggregate material shall have a Fine Aggregate Angularity of not less than specified in Table 1 when tested in accordance with AASHTO T304, Method A.

c. Sampling. ASTM D 75 shall be used in sampling coarse and fine aggregate, and ASTM C 183 shall be used in sampling mineral filler.

401-2.2 MINERAL FILLER. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D 242.

401-2.3 BITUMINOUS MATERIAL. The bituminous material shall conform to the requirements of AASHTO MP1, performance graded (PG) binder designation, as indicated elsewhere in the Contract. A certificate of compliance from the manufacturer must be included with the mix design submittal.

For each truck shipment a shipping ticket shall be prepared showing the supplier, location, grade of asphaltic material, additives (silicone or anti-strip), truck number, supplier's tank number from which the truck was loaded, average unit weight, quantity, and date and time of loading. A statement certifying that the material complies with [Combined State Binder Group](#) requirements and Department Specifications, shall be on or accompany the shipping ticket. The company invoice or manifest form may be used for this purpose.

In addition to the usual Contractor's copy of the shipping ticket, a copy of the shipping ticket containing the certification language for each truck shipment also shall be made available to the Engineer at the job site.

401-2.4 PRELIMINARY MATERIAL ACCEPTANCE. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse Aggregate.

- (1) Percent of wear.
- (2) Soundness.
- (3) Unit weight of slag.
- (4) Coarse Aggregate Fractured Faces Determination (Coarse Aggregate Angularity).

b. Fine Aggregate.

- (1) Sand equivalent.
- (2) Fine Aggregate Angularity.

c. Mineral Filler.

d. Bituminous Material. The certification(s) shall show the appropriate AASHTO test(s) for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

COMPOSITION

401-3.1 COMPOSITION OF MIXTURE. The bituminous plant mix shall be composed of a mixture of well-graded aggregate, filler if required, and bituminous material. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 JOB MIX FORMULA. No bituminous mixture for payment shall be produced until a job mix formula has been approved in writing by the Engineer. The bituminous mixture shall be designed using the Level 1 Superpave™ design procedure outlined in AASHTO PP28, A Practice for Superpave™ Volumetric Design for Hot Mix Asphalt (HMA). The Superpave™ mixture designs submitted shall comply with AASHTO MP2, A Specification For Superpave™ Volumetric Mix, and shall meet the requirements outlined below.

The Tensile Strength Ratio (TSR) of the composite mixture with anti-stripping additive shall be greater than or equal to 75; or in the case with no anti-stripping additive shall be greater than or equal to 70; when tested in accordance with ASTM D 4867. Test specimens shall have an air void content of 6 to 8 percent and a degree of saturation of 55 to 80 percent. If an anti-stripping agent is required, it shall be provided by the Contractor at no additional cost.

The job mix formula shall be submitted in writing by the Contractor to the Engineer at least 14 days prior to the start of paving operations. The job mix formula shall include as a minimum:

- a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percentage by weight of each stockpile used in the JMF.
- b. Percent of asphalt cement.
- c. Asphalt Performance Grade.
- d. Number of gyrations and air voids for N_{des} , N_{ini} , and N_{max}
- e. Plot of the combined gradation on the Federal Highway Administration (FHWA) 45 power gradation curve.
- f. Graphical plots of the air voids, voids in the mineral aggregate, and unit weight verses asphalt content.
- g. Coarse Aggregate Angularity.
- h. Percent elongated particles.
- i. Tensile Strength Ratio (TSR).
- j. Antistrip agent (if required).
- k. Sand equivalent value of the fine aggregate.
- l. Fine Aggregate Angularity of the combined blend.
- m. Dust to effective asphalt ratio.

The Contractor shall submit samples to the Engineer, upon request, for job mix formula verification testing.

The job mix formula for each mixture shall be in effect until modified in writing by the Engineer. Should a change in sources of materials be made, a new job mix formula must be approved in writing by the Engineer before the new material is used.

TABLE 1
SUPERPAVE™ DESIGN CRITERIA

Mixture Type	E - 1	E - 3	E - 10	E-30
Initial Number of Gyration (N _{ini})	7	7	8	8
Design Number of Gyration (N _{des})	60	75	100	100
Maximum Number of Gyration (N _{max})	75	115	160	160
Wear (max % loss)	50	45	45	45
Soundness (sodium sulfate, max % loss)	12	12	12	12
Fractured Faces (one face/two face, % by count)	65/___	75/60	85/80	98/90
Air voids (Va) @ N _{des}	4.0	4.0	4.0	4.0
Voids filled with Asphalt @ N _{des} , %	65-78	65-75	65-75 (1)	65-75 (1)
Dust to effective asphalt ratio ⁽²⁾ (% passing 0.075/P _{be})	0.6-1.2	0.6-1.2	0.6-1.2	0.6-1.2
Fine Aggregate Angularity	40	43	45	45
Sand Equivalency (ASTM D 2419, min)	40	40	45	45
%G _{mm} @ N _{ini}	<90.5 ⁽³⁾	<89.0 ⁽³⁾	<89.0	<89.0
%G _{mm} @ N _{max}	≤98.0	≤98.0	≤98.0	≤98.0

(1) For 9.5mm nominal maximum size mixtures, the specified VFA 73 – 76%.

(2) The percent maximum density at initial compaction is only a guideline.

(3) For Gradation that passes below the boundaries of the caution zone (ref. AASHTO MP3), the dust to binder ratio limits are 0.6 – 1.6

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory screens, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM Standard C136 and C117.

The gradations in Table 2 represent the limits, which shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as selected (and used in the JMF), shall have a gradation within the limits designated in Table 2.

Deviations from the final approved mix design for bitumen content and gradation of aggregates shall be within the limits specified in paragraph 401-6.5a., PROVIDED DEVIATIONS FALL INSIDE THE CONTROL POINTS IN TABLE 2.

TABLE 2
AGGREGATE—BITUMINOUS PAVEMENTS

	¾-inch (19 mm) Nominal Maximum Size Aggregate		½-inch (12.5 mm) Nominal Maximum Size Aggregate		3/8-inch (9.5 mm) Nominal Maximum Size Aggregate	
Sieve Size	Gradation Control Points Percent Passing by Weight		Gradation Control Points Percent Passing by Weight		Gradation Control Points Percent Passing by Weight	
	Min	Max	Min	Max	Min	Max
1 in. (25.4 mm)	100	100				
¾ in. (19.0 mm)	90	100	100	100		
½ in. (12.5 mm)		90	90	100	100	100
3/8 in. (9.5 mm)				90	90	100
No. 4 (4.75 mm)						90
No. 8 (2.36 mm)	23	49	28	58	20	65
No. 200 (0.075 mm)	2	8	2	10	2	10
Voids in Mineral Aggregate @ N _{des} , %	13.0		14.0		15.0	

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when the specific gravity varies by 10 percent or more.

401-3.3 RECYCLED ASPHALT CONCRETE. Recycled asphalt concrete shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt cement. RAP may be used for all courses.

The RAP shall be of a consistent gradation and asphalt content. The Contractor may obtain the RAP from the job site or an existing source.

All new aggregates used in the recycled mix shall meet the requirements of paragraph 401-2.1. New bituminous material shall meet the requirements of paragraph 401-2.3.

The Contractor may use up to 35 percent RAP material in lower layer and base mixtures and up to 20 percent in upper layer mixtures. The combined RAP and virgin aggregate shall meet the aggregate requirements from Table 1.

The percentage of recovered asphaltic materials from RAP shall be established for the mixture design according to AASHTO T 164 using the appropriate dust correction procedure. When test results indicate that a change has occurred in the percentage of RAP, the Contractor or the Engineer may request a change in the design recovered asphaltic material from RAP. The request shall include at least 2 recent RAP extractions from the Contractor's mixture design laboratory. When PG asphaltic materials are specified in the contract, the Contractor may use up to 25 percent RAP for lower layers and up to 20 percent RAP for upper layers without a change in PG grade. If greater amounts of RAP are used, the virgin asphaltic material shall have a low temperature property that is one PG grade lower than designated in the contract, unless Contractor or supplier testing indicates that the resultant asphaltic material blend meets the PG grade originally specified in the contract.

The RAP shall not contain any material that has been treated with a coal-tar sealer rejuvenator or material that contains coal-tar.

In addition to the requirements of paragraph 401-3.2, the job mix formula shall indicate the percent of reclaimed asphalt pavement.

The Contractor shall submit documentation to the Engineer, indicating that the mixing equipment proposed for use is adequate to mix the percent of RAP shown in the job mix formula and meet all local and national environmental regulations.

401-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare and place a quantity of bituminous mixture according to the job mix formula. The amount of mixture should be sufficient to construct a test section 300 feet long and two paver passes wide placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 401-5.1 and 401-6.3. As a minimum the test section shall consist of 3 sublots.

The test section shall be considered acceptable if; 1) mat density, air voids ($\%G_{mm} @ N_{des}$), and joint density are 90 percent or more within limits based on the PWL calculations, 2) the gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and 3) the Voids in Mineral Aggregate @ N_{des} , Voids filled with Asphalt @ N_{des} , and Dust Proportion are within the limits of Table 1.

If the initial test section should prove to be unacceptable, the necessary adjustments to the job mix formula, plant operation, placing procedures, and/or rolling procedures shall be made. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Full production shall not begin until an acceptable test section has been constructed and accepted by the Engineer. The test section(s), shall be paid for in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the job mix formula. It should be recognized that the aggregates produced by the plant may not satisfy the gradation requirements or produce a mix that exactly meets the JMF. In those instances, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens should be prepared and the optimum bitumen content determined in the same manner as for the original design tests.

401-3.5 TESTING LABORATORY. The laboratory (including the personnel) used to develop the job mix formula shall have current status on the WisDOT list of ["Qualified Industry and Consultant Laboratories"](#) to perform asphalt mix sampling and testing, as established under the Title 23, CFR, Part 637 regulations. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

- a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
- b. A listing of equipment to be used in developing the job mix.
- c. A copy of the laboratory's quality control system.
- d. Evidence that the laboratory is accredited, for the test methods required herein by a nationally recognized laboratory accreditation organization.

CONSTRUCTION METHODS

401-4.1 WEATHER LIMITATIONS. The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 3. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

TABLE 3. BASE TEMPERATURE LIMITATIONS

Mat Thickness	Base Temperature (Minimum)	
	Deg. F	Deg. C
3 in. (7.5 cm) or greater	40	4
Greater than 1 in. (2.5 cm) but less than 3 in. (7.5 cm)	45	7
1 in. (2.5 cm) or less	50	10

401-4.2 BITUMINOUS MIXING PLANT. Plants used for the preparation of bituminous mixtures shall conform to the requirements of ASTM D 995 with the following changes:

a. Requirements for All Plants.

(1) Truck Scales. The bituminous mixture shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, Section 90-01.

(2) Testing Facilities. The Contractor shall provide laboratory facilities at the plant in accordance with paragraph 401-6.2.

(3) Inspection of Plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

(4) Storage Bins and Surge Bins. Paragraph 3.9 of ASTM D 995 is deleted. Instead, the following applies. Use of surge bins or storage bins for temporary storage of hot bituminous mixtures will be permitted as follows:

(a) The bituminous mixture may be stored in surge bins for period of time not to exceed 3 hours.

(b) The bituminous mixture may be stored in insulated storage bins for a period of time not to exceed 24 hours.

The bins shall be such that mix drawn from them meets the same requirements as mix loaded directly into trucks.

If the Engineer determines that there is an excessive amount of heat loss, segregation or oxidation of the mixture due to temporary storage, no overnight storage will be allowed.

401-4.3 HAULING EQUIPMENT. Trucks used for hauling bituminous mixtures shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, WisDOT approved non-petroleum release agent, or other approved material. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4 BITUMINOUS PAVERS. Bituminous pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

The paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices, which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet (9.14 m) in length.
- b. Taut string line (wire) set to grade.
- c. Short ski or shoe.
- d. Laser control.

401-4.5 ROLLERS. Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the bituminous mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.

401-4.6 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature. The temperature of the bituminous material delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325 degrees F (160 degrees C), unless otherwise required by the manufacturer.

401-4.7 PREPARATION OF MINERAL AGGREGATE. The aggregate for the mixture shall be heated and dried prior to introduction into the mixer. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350 degrees F (175 degrees C) when the asphalt is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.8 PREPARATION OF BITUMINOUS MIXTURE. The aggregates and the bituminous material shall be weighed or metered and introduced into the mixer in the amount specified by the job mix formula. The wet mixing time will be set to achieve 95 percent of coated particles

401-4.9 PREPARATION OF THE UNDERLYING SURFACE. Immediately before placing the bituminous mixture, the underlying course shall be cleaned of all dust and debris. A tack coat shall be applied in accordance with Item P-603, if required by the contract specifications.

401-4.10 TRANSPORTING, PLACING, AND FINISHING. The bituminous mixture shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-3. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided night placements. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

The initial placement and compaction of the mixture shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements.

Upon arrival, the mixture shall be placed to the full width by a bituminous paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 25' and section shown on the plans or specified in the contract except where edge lanes require less width to complete the area. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m).

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

401-4.11 COMPACTION OF MIXTURE. After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor.

The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened (and scrapers used), but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers.

Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.12 JOINTS. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be given a tack coat of bituminous material before placing any fresh mixture against the joint.

Longitudinal joints which are irregular, damaged, uncompacted, or otherwise defective shall be cut back to expose a clean, sound surface for the full depth of the course. All contact surfaces shall be given a tack coat of bituminous material prior to placing any fresh mixture against the joint.

MATERIAL ACCEPTANCE

401-5.1 ACCEPTANCE SAMPLING AND TESTING. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer. Testing organizations (including Contractor personnel and labs) performing these tests shall have current status on the WisDOT list of ["Qualified Industry and Consultant Laboratories"](#) to perform asphalt mix sampling and testing, as established under Title 23, CFR, Part 637 regulations. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness testing.

a. Plant-Produced Material. Plant-produced material shall be tested for air voids on a lot basis.

(1) Sampling. Sampling shall be from material deposited into trucks at the plant. Acceptance samples, for each lot, shall not be obtained from the first 50 tons of plant-produced material. The first 50 tons of plant-produced material shall be included in the requirements of paragraph 401-5.1b. Each day's anticipated production (placed in a single layer) shall be considered a lot and divided into equal sublots as shown in Table 4; except when anticipated daily production rates exceed 4,000 tons, the day's production shall be divided into 2 lots as shown in Table 4:

Table 4: Lot/Sublot Determination

Daily Production (Tons) (MG)		Daily Lots	Sublots (n)
50-500	68-680	Partial Lot	n=1
501-1000	681-907	Partial Lot	n=2
1001-1500	908-1361	1	n=3
1501-2000	1362-1814	1	n=4
2001-3000	1815-2722	1	n=5
3001-4000	2723-3629	1	n=6
4001-5000	3630-4536	2	n=4; n=3
5001-6000	4537-5443	2	n=4; n=4
6001-7000	5444-6350	2	n=5; n=5
7001-8000	6351-7257	2	n=6; n=5

Where anticipated daily production results in only one or two sublots, as indicated in Table 4, they shall be incorporated into the previous lot or the next lot, as appropriate. The total number of sublots will be used in the acceptance plan calculations; i.e., n = 5, or n = 6, for example.

Separate lots shall apply if changes occur in JMF, underlying courses, or pavement lift thickness. Where more than one plant is simultaneously producing material for the job, the lot sizes shall apply separately for each plant.

Sufficient material for preparation of test specimens for all acceptance and verification testing shall be sampled by the Contractor. The sampling locations shall be determined on a random basis, in accordance with the procedures contained in ASTM D 3665.

The Contractor shall retain the split portion of the asphaltic mixture and blended aggregate for 14 calendar days at the laboratory site. This 14-day retention period may be decreased if approved by the Engineer. At the completion of the project, the remaining samples still within the 14-day window may be disposed of with the approval of the Engineer.

(2) Testing. The Contractor shall prepare the laboratory compacted test specimens and provide the Engineer with a printout of all data generated by the gyratory compaction equipment. One set (two specimens) of laboratory compacted specimens shall be prepared once per sublot, at the design number of gyrations required by paragraph 401-3.2, Table 1, and in accordance with the compaction procedures outlined in AASHTO PP28 and AASHTO MP2.

Bulk specific gravity of each test specimen shall be measured by the Contractor, in accordance with ASTM D 2726 using the procedure for laboratory-prepared thoroughly dry specimens, or ASTM D 1188, whichever is applicable, for use in computing air voids. For air voids and pavement density, the theoretical maximum specific gravity of the mixture shall be measured for each sublot by the Contractor in accordance with ASTM D2041, Type C, D, or E container. The value used in the air voids computation for each sublot shall be based on the maximum specific gravity measurement performed for the sublot.

Air voids will be calculated in accordance with ASTM D 3203.

(3) Acceptance. Acceptance of plant-produced material for air voids will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

b. Field Placed Material. Material placed in the field shall be tested for mat and joint density on a lot basis.

1) Mat Density. The lot size shall be the same as that indicated in paragraph 401-5.1.a(1) and shall be divided into the same equal sublots. Two 6-inch diameter cores of finished, compacted materials shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer for each subplot on a random basis in accordance with procedures contained in ASTM D 3665. Cores shall not be taken closer than one foot from a transverse or longitudinal joint. The Contractor will be allowed to take companion samples.

(2) Sampling. Samples shall be neatly cut with a core drill. The cutting edge of the core drill bit shall be of hardened steel or other suitable material with diamond chips embedded in the metal cutting edge. Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored pavement. Cored holes shall be filled in a manner acceptable to the Engineer and within one day after sampling.

(3) Testing. The average bulk specific gravity of the two cores sampled will be measured by the Engineer in accordance with ASTM D 2726 or ASTM D 1188, whichever is applicable. The percent compaction (density) of each sampled subplot will be determined by dividing the average bulk specific gravity of each subplot sampled by the maximum theoretical specific gravity for that subplot, as determined by paragraph 401-5.1a(2).

(4) Joint Density. The lot size shall be the total length of longitudinal joints constructed by a lot of material as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. Two nuclear tests (averaged) shall be taken by the Contractor from each subplot location. Test locations will be determined on a random basis in accordance with procedures contained in ASTM D 3665. All tests shall be within one foot of the joint. The density results obtained by nuclear methods are relative and correlation with other test methods such as ASTM D 1188 or ASTM D 2726 are required to convert the results obtained using this method to actual density. At least seven core densities and seven nuclear densities shall be used to establish a conversion factor.

(5) Acceptance. Acceptance of field placed material for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2c. Acceptance for joint density will be determined in accordance with the requirements of paragraph 401-5.2d.

c. Partial Lots - Plant-Produced Material. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the previous lot or next lot as appropriate, and the total number of sublots shall be used in the acceptance plan calculation, i.e., $n = 5$ or $n = 6$, for example.

d. Partial Lots - Field Placed Material. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, less than 3 samples (6 cored specimens) shall be obtained for the acceptance plan calculations, i.e., $n = 3$.

401-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the bituminous mixture and completed pavement as well as the implementation of the Contractor's Quality Control plan and test results:

- | | | |
|-----------------|-------------------|----------------|
| (1) Air voids | (3) Joint density | (5) Smoothness |
| (2) Mat density | (4) Thickness | (6) Grade |

Air voids, mat density, and joint density will be evaluated for acceptance on a lot basis using the method of estimating percentage of material within specification limits (PWL). Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L) or below the upper specification tolerance limit (U).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2.f(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2f(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2f(6).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of bituminous mixture which is rendered unfit for use due to contamination, segregation, or incomplete coating of aggregate. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and, if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Air Voids. Evaluation for acceptance of each lot of plant produced material for air voids shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher. Consistently producing at a target air void content between 3.35 and 4.65 percent with a standard deviation of 0.65 percent will result in an average PWL of 90.

c. Mat Density. Evaluation for acceptance of each lot of in-place pavement for mat density shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher. Consistently producing at a target mat density of 94 percent with a standard deviation of 1.2 percent will result in an average PWL of 90.

d. Joint Density. Evaluation for acceptance of each lot of in-place pavement for joint density shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher. Consistently producing at a target joint density of 92.3 percent with a standard deviation of 1.8 percent will result in an average PWL of 90. Consistently producing at a target joint density of 91.5 percent with a standard deviation of 1.8 percent will result in an average PWL of 80. Consistently producing at a target joint density of 91.0 percent with a standard deviation of 1.8 percent will result in an average PWL of 71.

e. Percentage of Material Within Specification Limits (PWL). The percentage of material within specification limits (PWL) shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The specification tolerance limits (L) and (U) are contained in Table 5.

TABLE 5
ACCEPTANCE LIMITS

Test Property	Specification Tolerance Limits	
	Lower	Upper
Air Voids, (% @ N_{des})	2.5	5.5
Mat Density, %G _{mm}	92.5 ¹	
Joint Density, %G _{mm}	90.0	

¹On a per lot basis, the lower limit may be reduced by one percent to 91.5 for the first lift of the lower layer constructed on crushed aggregate or recycled base courses, however payment for any lot constructed under this provision may not exceed 100%.

f. Acceptance Criteria.

(1) Mat Density and Air Voids. If the PWL of the lot equals or exceeds 90 percent, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 401-8.1.

(2) Paragraph reserved.

(3) Joint Density. If the PWL of the lot is equal to or exceeds 90 percent, the lot shall be considered acceptable. If the PWL is less than 90 percent, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80 percent, the Contractor shall cease operations and until the reason for poor compaction has been determined.

(4) Thickness. Thickness shall be evaluated for compliance by the Engineer to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each subplot for density measurement.

(5) Smoothness. The finished surfaces of the pavement shall not vary more than 3/8 inch (9.5 mm) for base course and 1/4 inch (6.2 mm) for surface course. Each lot shall be evaluated with a 12-foot (3.6 m) straightedge. The lot size shall be 2,000 square yards (1,650 square meters). Measurements will be made perpendicular and parallel to the centerline at distances not to exceed 50 feet (15.2 m). When more than 15 percent of all measurements within a lot exceed the specified tolerance, the Contractor shall remove the deficient area and replace with new material. Sufficient material shall be removed to allow at least one inch of asphalt concrete to be placed. Skin patching shall not be permitted. High points may be ground off.

(6) Grade. The finished surface of the pavement shall not vary from the grade line elevations and cross sections shown on the plans by more than 1/2 inch (12.5 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15.2 m) or less longitudinally and transversely to determine the elevation of the completed pavement. The lot size shall be 2,000 square yards (1,650 square meters). When more than 15 percent of all the measurements within a lot are outside the specified tolerance, the Contractor shall remove the deficient area and replace with new material. Sufficient material shall be removed to allow at least 3X nominal top size aggregate (ex. 1/2" aggregate = 1 1/2") of asphalt concrete to be placed. Skin patching for correcting low areas shall not be permitted. High points may be ground off.

g. Outliers. All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E 178, at a significance level of 5 percent. Outliers shall be discarded, and the PWL shall be determined using the remaining test values.

401-5.3 RESAMPLING PAVEMENT.

a. General. Resampling of a lot of pavement for mat density will be allowed if the Contractor requests, in writing, within 48 hours after receiving the written test results from the Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2c. Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for Resampled Lots. The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. If the tests within a lot include a very large or a very small value which appears to be outside the normal limits of variation, check for an outlier in accordance with ASTM E 178, at a significance level of 5 percent, to determine if this value should be discarded when computing the PWL.

401-5.4 VERIFICATION. The Engineer will conduct verification tests for the following:

a. Maximum Specific Gravity. On split samples of the mixture taken by the Contractor.

b. Bulk Specific Gravity. On split samples of the mixture taken by the Contractor, the Engineer will prepare laboratory compacted specimens and test bulk specific gravity.

c. Joint Density. Nuclear testing at the locations determined by paragraph 401-5.1b(4).

d. Frequency. The frequency will be equal to or greater than ten percent of the tests required for acceptance. The data will be provided to the Contractor within two asphaltic mixture production days after the sample has been obtained by the Engineer. At least one sample will be tested by the Engineer from the first two days of production. The Engineer may select any or all of the remaining Contractor retained samples for verification testing. An asphaltic technician certified at Asphtec I under the [Wisconsin Highway Technician Certification Program \(HTCP\)](#) program will perform all assurance tests and analyze the data. In all cases, the Engineer's testing will be conducted in a laboratory separate from the Contractor's. The verification laboratory performing these tests shall have current status on the WisDOT list of "[Qualified Industry and Consultant Laboratories](#)" to perform asphalt mix sampling and testing, as established under Title 23, CFR, Part 637 regulations. The Contractor shall be allowed to inspect measuring and testing devices to confirm both calibration and condition. The Engineer will calibrate and correlate all testing equipment in accordance with industry standards. Differences between the Contractor and Engineer's test results will be considered acceptable if within the following limits:

1. Maximum Specific Gravity	0.020
2. Bulk Specific Gravity (verification specimen)	0.030
3. Joint Density	1.0%

The results of verification tests performed by the Engineer will be posted in the Contractor's laboratory located at the plant site as the data becomes available. If comparison test results are outside the above allowable differences, the Engineer will investigate the reason immediately. The Engineer may stop production while the investigation is in progress if the potential for a pavement failure is present. The Engineer's investigation may include testing of the remaining split samples, review and observation of the Contractor's testing procedures and equipment, and a comparison of split sample test results by the Contractor quality control laboratory, and the Engineer's laboratory. If reasons for the differences cannot

be determined, the Engineer's results will be used.

The Engineer will periodically witness the sampling and testing being performed by the Contractor. If the Engineer observes that the sampling and quality control tests are not being performed in accordance with the applicable test procedures, the Engineer may stop production until corrective action is taken. The Engineer will notify the Contractor of observed deficiencies promptly, both verbally and in writing. The Engineer will document all witnessed sampling and testing. If a difference exists between the Contractor and the Engineer, WisDOT central laboratory will be asked to advise on the proper sampling and testing procedure.

401-5.5 LEVELING COURSE. Any variable thickness course, indicated on the plans, used for truing and leveling shall meet the requirements of paragraph 401-3.2 and 5.2b, but shall not be subject to the density requirements of paragraph 401-5.2c and d. The leveling course shall be compacted with the same effort used to achieve density of the test section. The truing and leveling course shall not exceed a nominal thickness of 1-1/2 inches (37.5 mm).

CONTRACTOR QUALITY CONTROL

401-6.1 GENERAL. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements which effect the quality of the pavement including, but not limited to:

- | | |
|-------------------------|------------------------------|
| a. Mix Design | f. Mixing and Transportation |
| b. Aggregate Grading | g. Placing and Finishing |
| c. Quality of Materials | h. Joints |
| d. Stockpile Management | i. Compaction |
| e. Proportioning | j. Surface smoothness |

401-6.2 TESTING LABORATORY. The Contractor shall provide a fully equipped asphalt laboratory located at the plant site. It must have adequate equipment for the performance of the tests required by these specifications. The laboratory shall be made available to the Engineer to perform mat density testing, but mat density testing shall not interfere with the Contractor's process control testing. The laboratory (including personnel performing these tests) shall have current status on the WisDOT list of "[Qualified Industry and Consultant Laboratories](#)" to perform asphalt mix sampling and testing, as established under Title 23, CFR, Part 637 regulations.

The effective working area of the laboratory shall be a minimum of 150 square feet (14 square meters) with a ceiling height of not less than 7.5 feet (2.3 meters). Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 70 degrees F + 5 degrees (21 degrees C + 2.3 degrees C).

Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-6.3 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but not necessarily limited to, tests for the control of asphalt content, aggregate gradation, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt Content. A minimum of two extraction tests shall be performed per lot in accordance with ASTM D 2172 or ASTM D 6307 for determination of asphalt content. The weight of ash portion of the extraction test, as described in ASTM D 2172, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.

The use of the nuclear method for determining asphalt content in accordance with ASTM D 4125 is permitted, provided that it is calibrated for the specific mix being used.

The use of an ignition binder oven for determining asphalt content in accordance with ASTM D-6307 (formerly PS90) is permitted, provided that it is calibrated for the specific mix being used. This calibration shall be provided to the Engineer prior to the start of production. The Engineer reserves the right to verify the calibration of any equipment.

The use of the plant gage reading method (as approved by the engineer) for determining asphalt content is permitted. Record the reading as close to representing the sample as possible.

The calculation method for determining asphalt content is permitted. When calculating the asphalt content (P_b) use the following equation:

$$P = 100 \times \frac{G_B}{G_{MM}} \times \frac{(G_{SE} - G_{MM})}{(G_{SE} - G_B)}$$

Where:

G_{mm} = MAXIMUM SPECIFIC GRAVITY, from current sample test result

G_{se} = AGGREGATE EFFECTIVE SPECIFIC GRAVITY, from previous day

G_b = BINDER SPECIFIC GRAVITY, from the mix design

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with AASHTO T 30 and ASTM C 136 (Dry Sieve). As an option, or when asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix or continuous mix plants, and tested in accordance with ASTM C 136 (dry sieve) using actual batch weights to determine the combined aggregate gradation of the mixture. If RAP is used in the mix and the asphalt content is determined by the ignition method, aggregate gradations shall be determined from mechanical analysis of the extracted (ignited) aggregate in accordance with AASHTO T30 or ASTM C117 and ASTM C136 (Dry Sieve). If RAP is not used in the mix and the asphalt content is determined by the ignition method, aggregate gradations shall be determined from a mechanical analysis of the combined virgin aggregate, taken just prior to introduction into the dryer drum or mixer, and tested in accordance with ASTM C117 and ASTM C136 (Dry Sieve).

c. Fine Aggregate Angularity. The fine aggregate angularity of the fine aggregate used for production shall be determined once per lot in accordance with AASHTO T304, Method A.

d. In-Place Density Monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D 2950.

e. Additional Testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

f. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 SAMPLING. When directed by the Engineer, the Contractor shall sample and test any material which appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-6.5 CONTROL CHARTS. The Contractor shall maintain linear control charts both for individual measurements and a running average of the last 4 data points for aggregate gradation and asphalt content.

Control charts shall be posted at the Contractor's laboratory. Test results obtained by the Contractor shall be recorded on the control charts the same day the tests are conducted. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Job Mix Formula limits and the Warning limits applicable to each test parameter, and the Contractor's test results. The following data shall be recorded on the standardized control charts:

- ☐ Blended Aggregate Gradation Tests
- ☐ Asphalt Content, percent

Both the individual test point and the running average of the last four data points shall be plotted on each chart. The Contractor's test data shall be shown in black and running average in red. The Engineer's assurance data will be plotted in blue. The warning limits shall be drawn with a dashed green line and the Job Mix Formula limits with a dashed red line. Computer drawn charts may be used with the approval of the Engineer.

The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Control Limits. The following control limits for the job mix formula and warning limits are based on a running average of the last 4 data points:

ITEM	JOB MIX FORMULA LIMITS	WARNING LIMITS
Percent passing given sieve:		
1 in. (25.0 mm)	± 6.0	± 4.5
¾ in. (19.0 mm)	± 5.5	± 4.0
½ in. (12.5 mm)	± 5.5	± 4.0
3/8 in. (9.5 mm)	± 5.5	± 4.0
No. 8 (2.36 mm)	± 5.0	± 4.0
No. 200 (75 µm)	± 2.0	± 1.5
Asphalt content in percent	± 0.4	± 0.3

b. Warning Bands. Warning Bands are defined as the area between the Job Mix Formula limits and the warning limits.

c. Job Mix Formula Adjustment. A request for a Job Mix Formula adjustment may be made to the Engineer by the Contractor. The requested change will be reviewed for the Department by a Certified Asphaltic Technician III under the [Wisconsin Highway Technician Certification Program \(HTCP\)](#). If acceptable, a revised Job Mix Formula shall be issued. The number of adjustments will be limited according to current Department policy. Adjustments to conform to actual production shall not exceed the tolerances specified for the Job Mix Formula limits. Regardless of such tolerances, the adjusted Job Mix Formula shall be within the mixture specification master gradation bands. Should a redesign of the mixture become necessary, a new Job Mix Formula shall be submitted according to the requirements of the specification. The Job Mix Formula asphalt content may only be reduced if the production Voids Mineral Aggregate meets or exceeds the minimum Voids Mineral Aggregate design requirement for the mixture being produced.

d. Corrective Action. When the running average values trend toward the warning limits, the Contractor shall consider taking corrective action. The corrective action, if any, shall be documented. All tests shall be part of the contract files and shall be included in the running average calculations. The Contractor shall notify the Engineer whenever the running average values exceed the warning limits. If two consecutive running average values exceed the warning limits, the Contractor shall stop production and make adjustments. Production shall only be restarted after notifying the Engineer of the adjustments made. The running average shall not be calculated until the fourth test after the required stop in production.

If the process adjustment improves the property in question such that the running average after four additional tests is within the warning limits, the Contractor may continue production. If the adjustment does not improve the properties and the running average after four additional tests stays in the warning bands, the mixture will be considered unsatisfactory.

If the running average values exceed the Job Mix Formula limits, the Contractor shall stop production and make adjustments. Production shall only be restarted after notifying the Engineer of the adjustments made. The calculation of the running average shall continue after the stop in production.

METHOD OF MEASUREMENT

401-7.1 MEASUREMENT.

a. Plant Mix. Plant mix bituminous concrete pavement shall be measured by the number of tons of bituminous mixture. No deduction for the weight of bituminous material will be made. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage. The plant or truck scales will be tested by the Engineer or by authorized testing firms or agencies. Weigh tickets showing the weight of each load of bituminous mixture shall be supplied to the Engineer.

b. Bituminous Material - Virgin. Bituminous material will be measured by the tons of material used in the accepted work. Measure of bituminous material by the ton will be based on the net weights of bituminous material shipments, except when batch weights are recorded or the job operations require the delivery of bituminous mixtures to be intermittent or in such minor quantities that the measurement based on net weights would be impracticable. In the later case, the measurement may be based on the theoretical percentage of bituminous material in the mixture or on the weight of bituminous material contained in each batch.

c. Bituminous Material - RAP. The bituminous material in RAP shall be measured by the tons of material accepted in the work. Measurement of the RAP bituminous material will equal the percentage of RAP bituminous material on the mixture design multiplied by the tonnage of RAP incorporated into the mixture. The tonnage of RAP used will be determined by taking the percentage RAP feed rate into the plant multiplied by the tonnage of bituminous pavement produced. The measurement for RAP bituminous material will be added to the quantity of Virgin bituminous material used of the project and paid for under the standard pay item for Bituminous Material.

BASIS OF PAYMENT

401-8.1 PAYMENT. Payment for an accepted lot of bituminous concrete pavement shall be made at the contract unit price per ton for bituminous mixture and bituminous material adjusted according to paragraph 401-8.1a, subject to the limitation that:

The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons of bituminous mixture and 100 percent of the product of the contract unit price and the number of tons of bituminous material used in the accepted work.

The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100 percent or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100 percent or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100 percent. The lot pay factor shall apply to both the bituminous mixture and the bituminous material.

TABLE 6. PRICE ADJUSTMENT SCHEDULE

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5PWL + 55
55 – 74	1.4PWL – 12
Below 55	Reject ¹

¹ The lot shall be removed and replaced at the contractors expense. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50 percent of the contract unit price and shall apply to both the bituminous mixture and the bituminous material.

2 Although it is theoretically possible to achieve a pay factor of 106 percent for each lot, actual payment above 100 percent shall be subject to the total project payment limitation specified in paragraph 401-8.1.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment in excess of 100 percent for accepted lots of bituminous concrete pavement shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100 percent.

b. Standard Pay Items for Work covered by this Specification are as follows:

Item P-401-8.1	Bituminous Surface Course, Type E-10, 1/2 - inch aggregate w/Bituminous Material, PG70-28 surface, & PG 64-28 binder, per ton.
Item P-401-8.2	Asphaltic Material, per ton.

TESTING REQUIREMENTS

ASTM C29	Unit Weight of Aggregate
ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117 Washing	Test Method for Materials Finer than 75-um (No.200) Sieve in Mineral Aggregates by
ASTM C131 Machine	Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles
ASTM C136	Sieve or Screen Analysis of Fine and Coarse Aggregates

ASTM C183	Sampling Hydraulic Cement
ASTM C566	Total Moisture Content of Aggregate by Drying
ASTM D75	Sampling Aggregates
ASTM D995	Requirements for Mixing Plants for Hot-Mixed Hot-Laid Bituminous Paving Mixtures
ASTM D118	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D1461	Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D1559-93	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D2041	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D2419	Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
ASTM D3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D2950	Density of Bituminous Concrete in Place by Nuclear Method
ASTM D3665	Random Sampling of Paving Materials
ASTM D4125	Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4791	Flat or Elongated Particles in Coarse Aggregate
ASTM D4867	Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5821	Standard Test Method for determining the percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	Asphalt Content of Hot Mix Asphalt by Ignition Method.
ASTM E178	Practice for Dealing With Outlying Observations
AASHTO T30	Mechanical Analysis of Extracted Aggregate
AASHTO T245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AASHTO T304	Test for Fine Aggregate Angularity (Method A)
AASHTO MP2	A Specification For Superpave™ Volumetric Mix Design
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils

AASHTO MP2 Superpave™ Volumetric Mix Design

AASHTO PP28 A Practice for Superpave™ Volumetric Design for Hot Mix Asphalt (HMA)

AASHTO T164 Quantitative Extraction of Bitumen From Bituminous Paving Mixtures

AASHTO T103 Soundness of Aggregates by Freezing and Thawing

AASHTO TP-5 Test Method for Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

AASHTO MP3 (Provisional)

MATERIAL REQUIREMENTS

ASTM D242 Mineral Filler for Bituminous Paving Mixtures

ASTM D946 Asphalt Cement for Use in Pavement Construction

ASTM D4552 Classifying Hot-Mix Recycling Agents

AASHTO MP1 Performance Graded Binder Designation